LISTING OF THE CLAIMS

1. (Currently Amended) An autothermal reactor for producing synthesis gas comprising:

a mixing chamber having an orifice to expand a heated oxygen containing stream into said mixing chamber and an inlet located adjacent to said orifice and oriented to introduce a hydrocarbon containing stream into the mixing chamber tangentially to said heated oxygen containing stream such that said hydrocarbon containing stream is entrained in said heated oxygen containing stream to mix oxygen in said heated oxygen containing stream with hydrocarbons contained in said hydrocarbon containing stream at a sufficiently rapid rate so as not to react the oxygen and the hydrocarbons, thereby to produce a reactant stream made up of an unreacted mixture of the heated oxygen containing stream and the hydrocarbon containing stream;

an initial partial oxidation reaction zone having a supported partial oxidation catalyst in communication with said mixing chamber and followed by at least two endothermic reforming reaction zones heated by an exothermic reaction of said partial oxidation reaction zone to react the oxygen and the hydrocarbons of said reactant stream and thereby to form said synthesis gas; and

the at least two endothermic reforming reaction zones containing a precious metal catalyst supported on supports formed of different materials that provide a greater surface area for a successive of the at least two endothermic reforming reaction zones than an initial of the at least two endothermic reforming reaction zones directly following the partial oxidation reaction zone, the initial and the successive of the at least two endothermic reforming reaction zones configured to operate at ever decreasing operational temperatures such that a material making up a support of the successive of the at least two endothermic reforming reaction zones remains stable.

2. (Original) The reactor of claim 1, wherein:

said mixing chamber is defined by an inner surface outwardly diverging from said orifice to form a frustum of a cone; and

said surface outwardly diverging from said orifice at an angle calculated to inhibit re-circulation within said mixing chamber.

3. (Original) The reactor of claim 1 or claim 2, wherein:

said partial oxidation zone is formed by a monolithic support; and

said endothermic reforming zones are formed by beds of pellets.

4. (Original) The reactor of claim 3, further comprising a ceramic heat shield of honeycomb configuration located between the partial oxidation reaction zone and the mixing chamber to inhibit heat transfer from the partial oxidation reaction zone to the mixing chamber.

5. (Original) The reactor of claim 3, wherein said monolith is of honeycomb configuration and said pellets of the initial of the at least two endothermic reforming reaction zones is formed by alpha-alumina and the successive of the at least two endothermic reforming reaction zones is formed by gamma-alumina, respectively.

6. (Original) The reactor of claim 3, wherein:

said mixing chamber is a primary mixing chamber; and

a secondary mixing chamber is situated between said partial oxidation reaction zone and said at least two endothermic reforming zones, said secondary mixing chamber having a secondary inlet to receive a recycle stream containing synthesis gas components obtained by separation of hydrogen and carbon monoxide from said synthesis gas.

7. (Original) The reactor of claim 3, wherein said mixing chamber, said partial oxidation reaction zone and said at least two endothermic reforming zones are in an inline relationship.

8. (Original) The reactor of claim 3, wherein the initial of said endothermic reforming reaction zones has a surface area from between about 0.1 and about 10 m^2/gm and the successive of the at least two endothermic reforming zones has surface areas from between about 5 and about 300 m^2/gm.

9. (Original) The reactor of claim 3 wherein said precious metal catalyst is Pt, Rh, Ru, Pd, or Ni.

10. (Original) The reactor of claim 3 where the monolithic support is formed from a ceramic doped with a partial oxidation catalyst.

Claims 11-15 (Withdrawn)